

## CLAIMS

1. An automatic ground marking apparatus for marking ground, the apparatus comprising:
- 5 a carriage responsive to carriage control signals for traversing the ground, the carriage comprising a controllable steering and drive system and a controllable marking system;
- a position determining system arranged to determine the position of the carriage; and
- 10 a processor responsive to the position determining system and generating the carriage control signals wherein the controllable steering and drive system respond to the carriage control signals to cause the carriage to traverse the ground and mark out a desired sign on the ground.
- 15 2. The automatic ground marking apparatus of claim 1, wherein the carriage control signals are transmitted to the carriage from a remote processor, and wherein the processor associates the carriage control signals with points defining the desired sign.
- 20 3. The automatic ground marking apparatus of claim 1, wherein the position determining system further comprises:
- a laser based electronic distance measuring device, the laser based electronic distance measuring device further comprising:
- a base station; and
- 25 a reflector.
4. The automatic ground marking apparatus of claim 3, wherein the base station and the processor are mounted to the carriage, and the processor is connected to receive position data from the base station.
- 30 5. The automatic ground marking apparatus of claim 3, wherein the base station is fixed to the ground and wherein the reflector is mounted to the carriage.

6. The automatic ground marking apparatus of claim 5, wherein the marking apparatus further comprises:  
a radio link to relay carriage control signals to the carriage from the processor.
- 5 7. The automatic ground marking apparatus of claim 1, wherein the controllable steering and drive system further comprises:  
a compass; and  
a processing device responsive to the compass to determine an actual bearing of the carriage.
- 10 8. The automatic ground marking apparatus of claim 7 wherein the further processing apparatus compares the actual bearing with a desired bearing encoded in the carriage control signals.
- 15 9. The automatic ground marking apparatus of claim 1, wherein the controllable marking system further comprises:  
a reservoir; and  
dispensing nozzle for a marking medium.
- 20 10. The automatic ground marking apparatus of claim 9, wherein a controllable valve interconnects the reservoir and dispensing nozzle.
11. The automatic ground marking apparatus of claim 1, wherein the controllable steering and drive system further comprises;  
25 a number of independently controllable drive units, wherein each of the independently controllable drive units is coupled to a wheel of the carriage.
12. The automatic ground marking apparatus of claim 11, wherein the carriage further comprises:  
30 a feedback sensor arranged to provide a feedback signal to the processor.
13. The automatic ground marking apparatus of claim 1, wherein the carriage further comprises:

an inclinometer for determining the attitude of the carriage.

14. The automatic ground marking apparatus of claim 13, wherein the inclinometer is coupled to a gimbal structure carrying a mast for a reflector and a marking means, wherein the inclinometer is arranged to maintain the mast in a vertical orientation.

15. A computer software product comprising logic stored on computer readable media and executable by a processor for causing a carriage including a controllable steering and drive system and a controllable marking system, to mark out a sign on a ground surface, the software product comprising:

carriage position logic for reading a carriage position from a data stream generated by a position sensing device;

sign point logic for reading a file of points defining a desired sign; and  
command logic for generating commands to cause a carriage to traverse the ground surface and dispense paint on the surface in order to mark out the sign.

16. A method for marking undulating turf, comprising the steps of:  
monitoring the position of an automated carriage arranged to move over a predetermined path;  
creating a collection of points defining a desired sign using recorded position coordinates; and  
processing the collection of points to generate control signals to cause the carriage to traverse the ground in the predetermined path to mark out the desired sign.

17. The method of claim 16, wherein the control signals are transmitted to the carriage in real time.

18. The method of claim 16, wherein the step of creating a collection of points further comprises the step of:

determining desired viewing positions for the desired sign.

5 19. The method of claim 16, wherein the position of the automated carriage is monitored from a remote site.

20. The method of claim 16, wherein the monitored from a position sensing device on-board the carriage.

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21. The method of claim 16, further comprising:

initiating movement of the automated carriage over the predetermined path;

and

15 recording position coordinates of the automated carriage for producing a digital terrain map.

22. A method of surveying a surface by a carriage adapted to automatically traverse the surface to be surveyed and associated with a position determining system, the method comprising the steps of:

20 defining a path for the carriage to follow to cover the surface to be surveyed;  
generating command signals to instruct the carriage to traverse the path;  
receiving positioning data for the carriage from the position determining system during the traverse;  
25 storing the positioning data in a data file.

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23. The method of claim 22, including the subsequent step of creating a digital terrain model (DTM) of the surface from the positioning data.

24. The method of claim 22, wherein the path includes a set of evenly  
30 spaced parallel lines and the data file defines a grid of points covering the survey surface.

25. The method of claim 22, wherein the position data comprises carriage level data, carriage latitude data and carriage longitude data.

26. A surveying apparatus for surveying a surface of interest, the surveying  
5 apparatus comprising:

a carriage means responsive to carriage control signals for traversing the ground, the carriage having a controllable steering and drive system;

a position determining means arranged to determine the position of the carriage;

10 a transmitter means for transmitting the positioning data from the position determining system to a remote station for the creation of a digital terrain model of the surface.

27. The surveying apparatus of claim 26, wherein the positioning data  
15 comprises carriage level data, carriage latitude data and carriage longitude data.